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SAN FRANCISCO'S ILLUMINATION FESTIVAL.

SKIN EFFECT WITH IRON AND STEEL CABLE.
BY CLEM A COPELAND.

OPERATION EXPENSES OF CALIFORNIA IRRIGATION COMPANIES.
BY S. T. HARDING.

DECISION OF PUBLIC SERVICE COMMISSION OF WASHINGTON ON IRRIGATION RATES.

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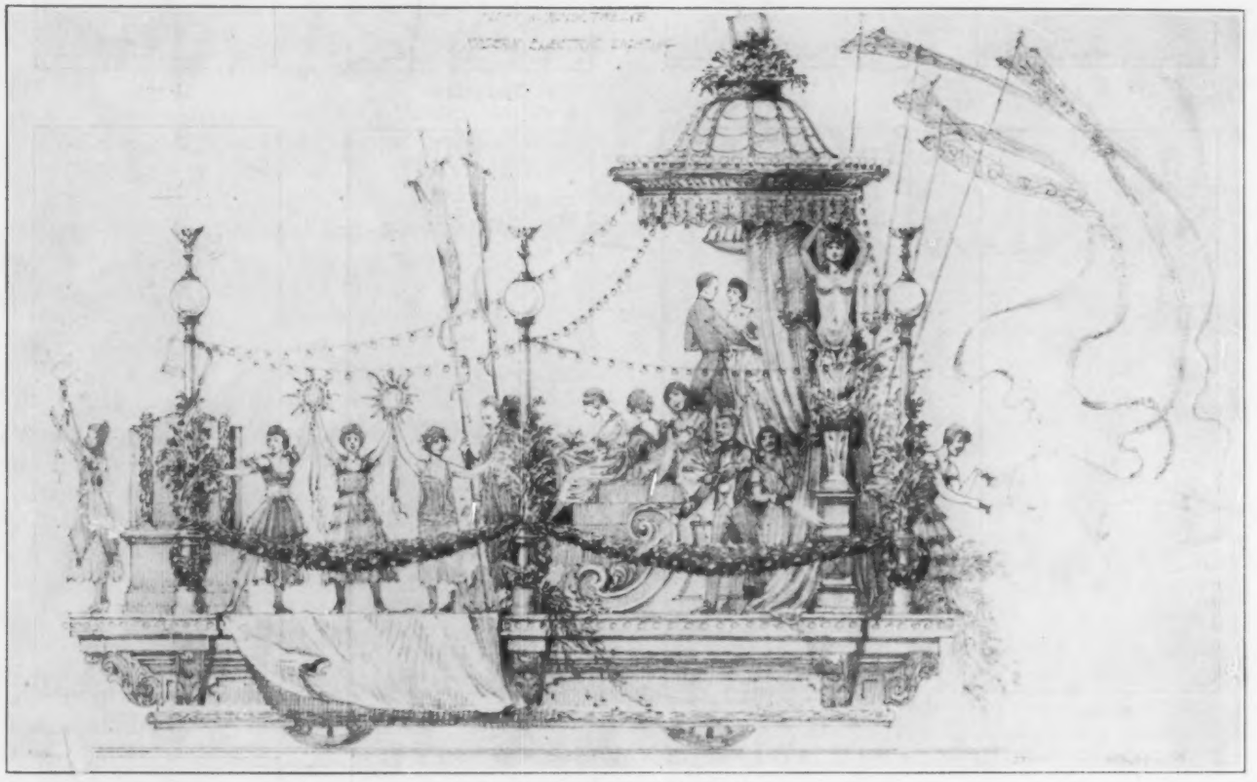
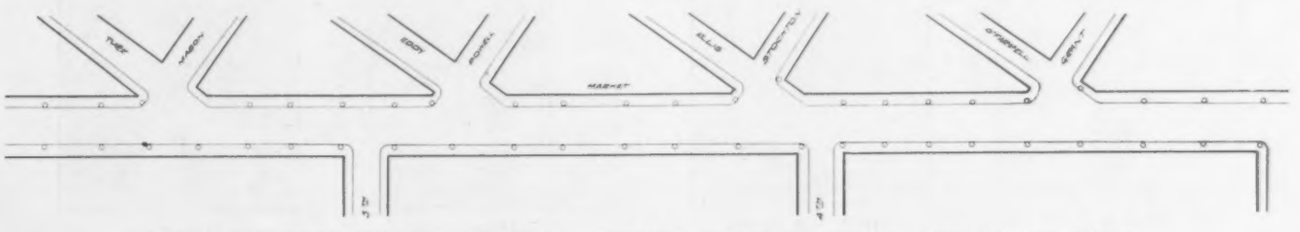
SAN FRANCISCO'S ILLUMINATION FESTIVAL



Modern Electric Lighting.

To celebrate the completion of the first section of San Francisco's new scheme of street illumination, a great electrical pageant is to be held on October 4th and 5th. Market street, the city's main thoroughfare, will then for the first time be lighted by luminous arc lamps on ornamental standards, such as were employed at the Panama-Pacific Exposition. At the same time the new city hall is to be dedicated, so that plans are being laid for a great carnival.

The most spectacular feature of the festival is to be an illumination parade with floats emblematic of the history of lighting from the time of the cave man down to the present. Through the courtesy of W. D'A. Ryan, the originator of this method of lighting and under whose direction the main floats are being constructed, illustrations are here shown of many of these floats, together with the accompanying standard bearers. These pictures are self-explanatory and of



Map of San Francisco's Business District, Showing Location of Beautiful New Lighting Effects.

Cave Man.

Assyrian.

Egyptian.

Greek.

Roman.

Middle Ages.

Renaissance.

1790, French.

1850, Gas.

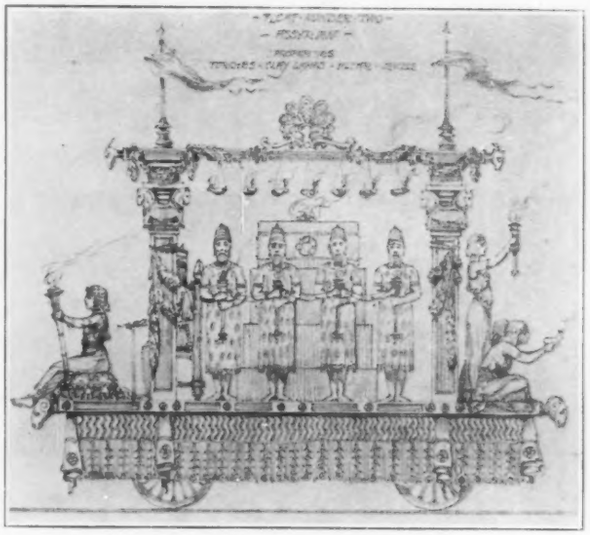
1870, Oil Lamp.

Marine.

Modern.

The Evolution of the Modern Electric Lamp.

The Cave Man, with Burning Pine Knot.



Assyrian, with Torch and Clay Lamp.

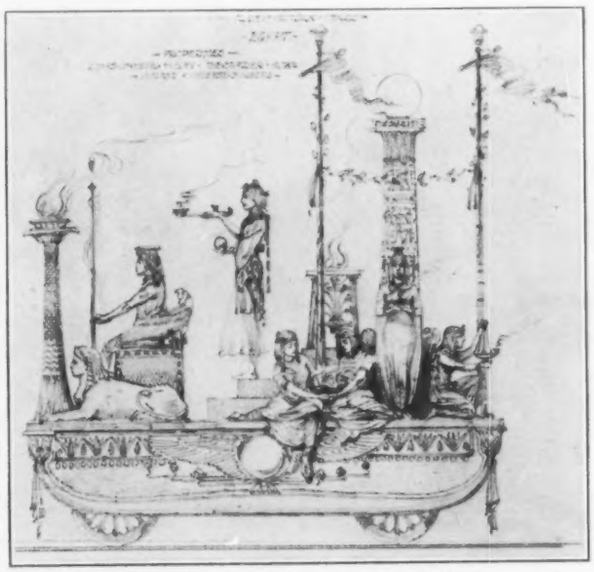
special interest to electrical and illuminating engineering as depicting progress in the science and art of illumination.

These floats are only a part of the pageant which is being arranged under the auspices of the Downtown Association by many civic organizations, including the Electrical Development and Jovian League. The parade committee of this latter organization has already provided twenty-one additional floats, headed by an animated representation of the Aladdin poster, which is to be featured during America's Electrical Week, December 2-9. Another notable float will be that of the Nela laboratories, showing a 30 ft. transparency of the Exposition at night, flashed by the Market street standards.

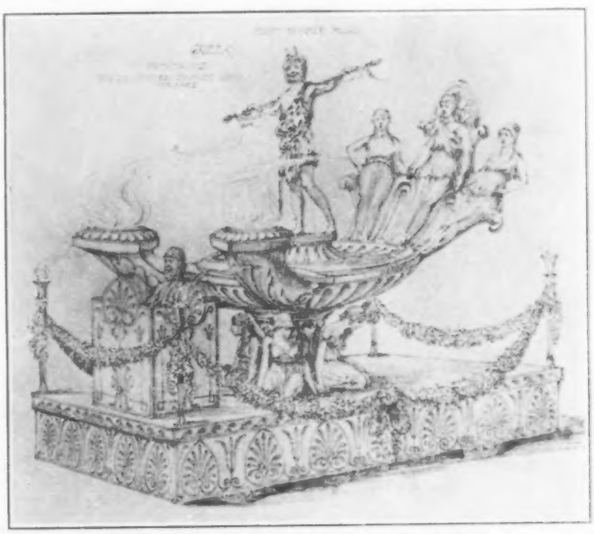
Other features include thousands of marchers, all in costume, and each carrying some form of light. Time magnesium flares will facilitate the taking of moving pictures; special fireworks will be provided, and the street will be decorated, prizes being awarded the best building fronts and display windows. The entire affair will partake of the nature of a Mardi Gras, and because of special rates offered by the railroads from all Pacific Coast points, is expected to attract large crowds from out of town.

The initial installation, which is then to be made the occasion of a lighting festival, extends for about 1½ miles along Market street, from the Ferry building to Seventh street. Three-light standards, 32 ft. in height, are placed at 110 ft. intervals. These standards consist of iron trolley poles surmounted by three General Electric ornamental luminous arc lamps. The standards were designed by Willis Polk, and modelled by Arthur Putnam and Leo. Lentelli. The finish is imitation bronze. The lamps are arranged as a triangle with plane transverse to the street.

The lamps are those used at the Panama-Pacific Exposition, with a new sectional globe of "San Francisco Gold Carrara glassware," specially made by the Gleason-Tiebout Company in collaboration with W. D'A. Ryan. The appearance is less obtrusive than the usual white or opal glassware, and, by day, gives the name "Path of Gold," which has been adopted for the lighted area. This glassware has but little greater absorption than white Carrara of the same diffusing

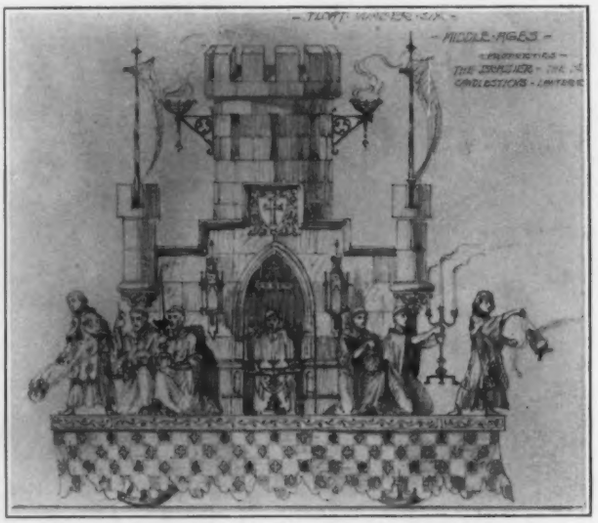


Egyptian, with Lamp and Brazier.

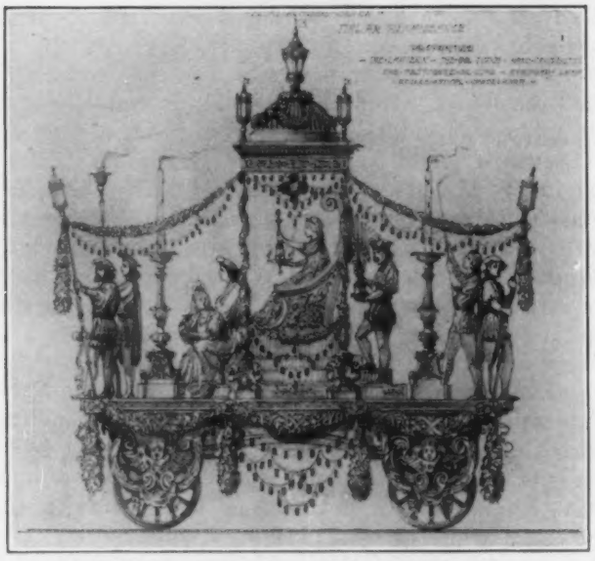


Grecian, with Decorated Bronze Lamp.

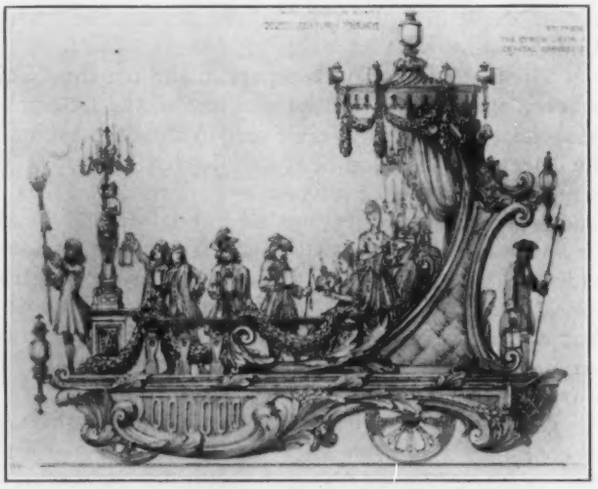
Roman with Candelabra.



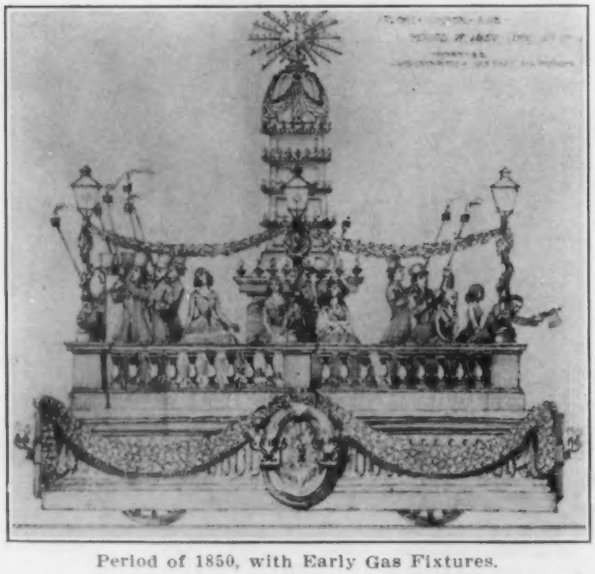
Middle Ages, with Candle, Lantern and Braziers.



Italian Renaissance, with Festooned Oil Cups.

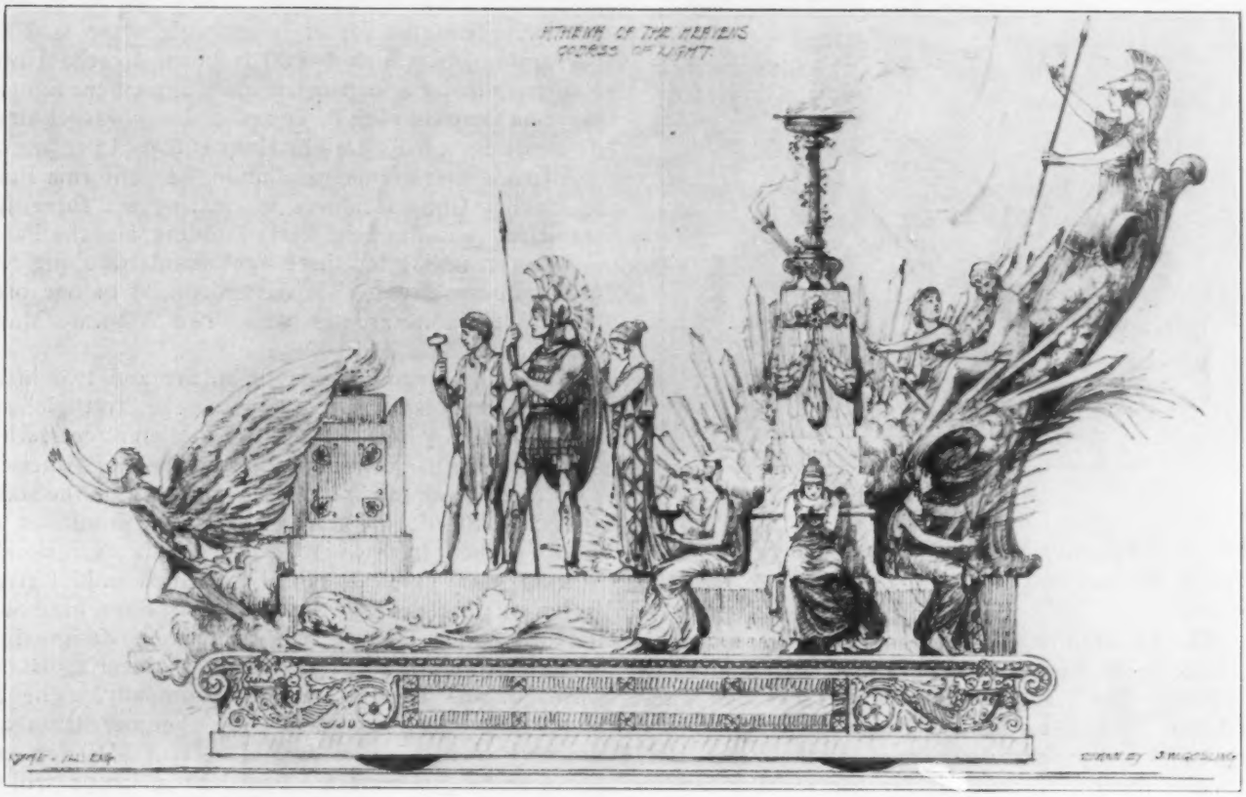


Eighteenth Century, French, with Hand Lanterns and Wall Brackets.

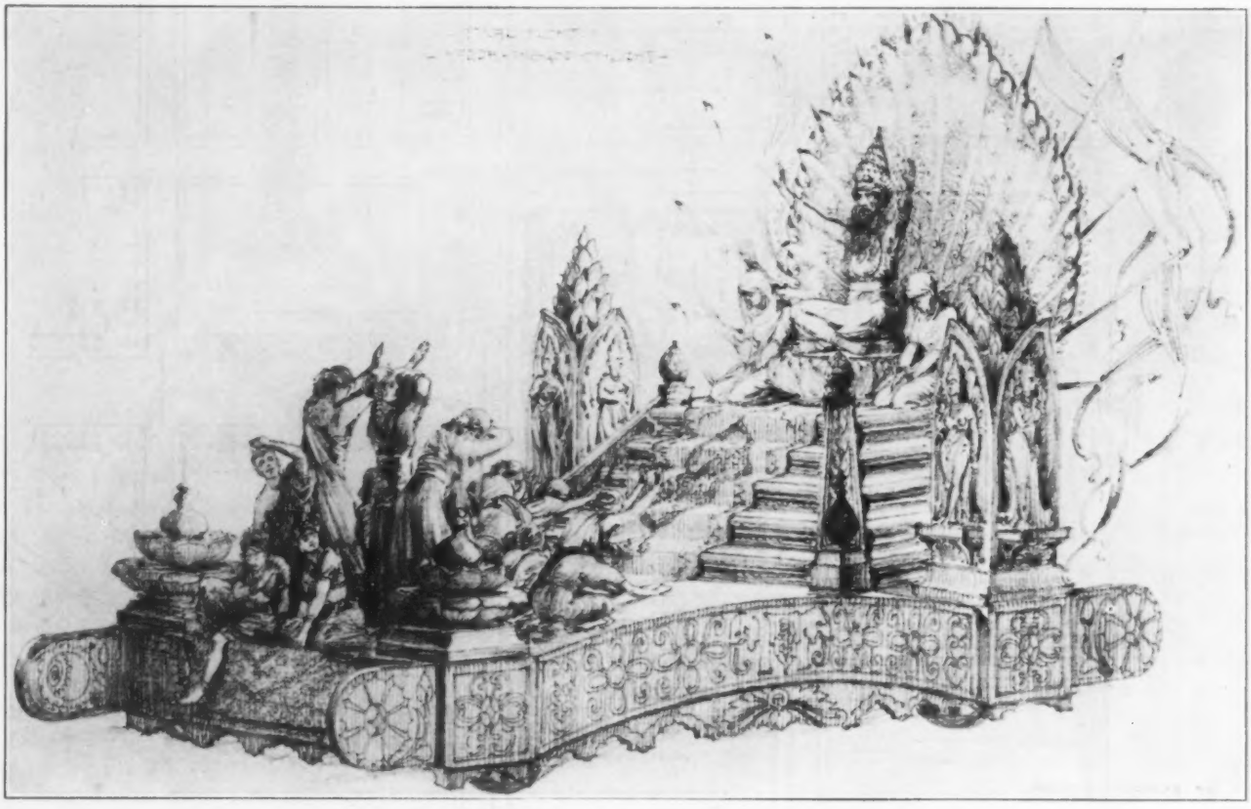


Period of 1850, with Early Gas Fixtures.

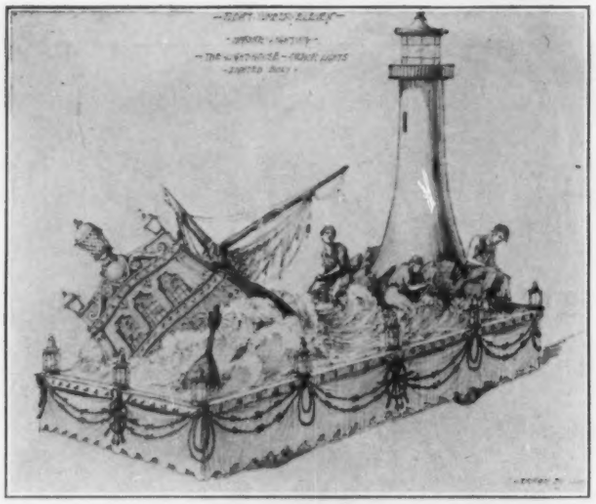
Period of 1870, with Oil Lamp and Calcium Lamp.



Athena of the Heavens, Goddess of Light, Representing the Arc.



Mazda, The God of Light, Representing the Incandescent.



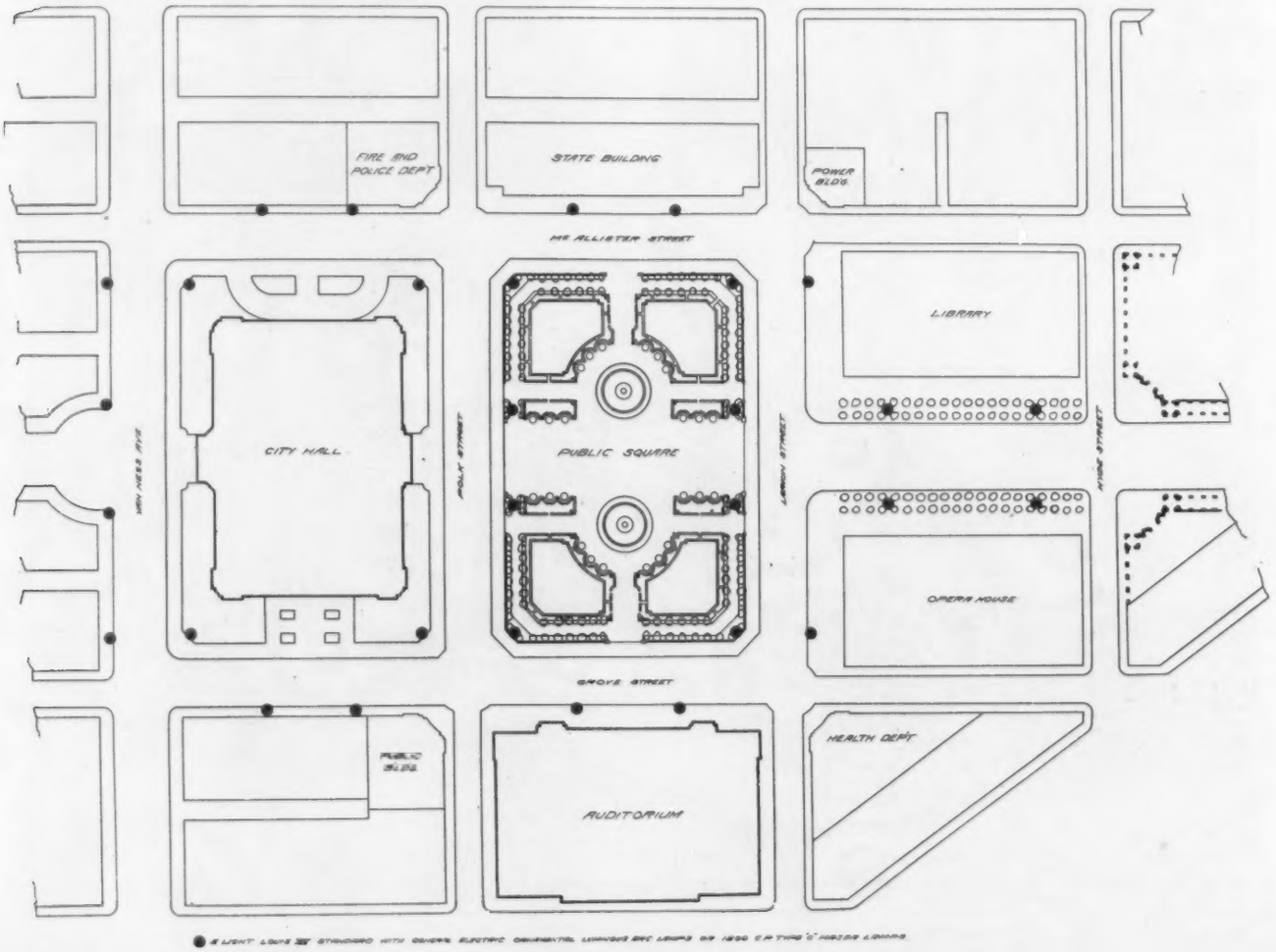
Marine Lighting.

quality. The effect is that of a warm white light, creating life and interest by the slight fluctuations of the arc.

The 137 standards along Market street, including an underground cable system, are being installed by the Pacific Gas & Electric Company at a cost of about $100,000. The Downtown Association, representing merchants and property owners along the street, have signed a three-year contract for the maintenance of the two side lights, which are to burn until midnight, and the city will maintain the center lamp on all-night service. The cost for each midnight lamp is $78.48 per annum, of which $48.00 is borne by the United Railroads under a former franchise agreement to maintain one lamp on each trolley pole along Market street. The rate for each all-night lamp is $96.73 per annum.

In addition to this installation the California Board of Harbor Commissioners is erecting six three-light standards in front of the Ferry building, and the Palace Hotel is installing ten three-light standards along New Montgomery street. The latter consist of one ornamental luminous arc lamp and two 200-watt Mazda lamps.

A similar combination of an arc and two incandescent lamps is to be employed in the "triangle" section bounded by Post, Powell and Market streets, which will probably be completed at the time of America's Electrical Week celebration. In this section the standards are 18½ ft. high and carry a 6.6 luminous arc lamp, flashed by two 100-watt Mazda "C" upright bracket lamps enclosed in 14 in. oval gold Carrara globes of less density than the glassware used with the arc lamps. These standards were designed by J. W. Gosling, of the illuminating engineering laboratories of the General Electric Company. The arc lamps are to be maintained by the merchants and property owners at an annual cost of $110 for each lamp, midnight service. The Mazda lamps will be



Lighting Plan, Civic Center.

maintained by the city at a cost of $54.75 per standard per year on all-night service.

The "triangle" illumination replaces the present method of lighting by means of fin-light Mazda standards, which are staggered at 80 ft. intervals. The same poles and distribution system will be used, together with new underground series arc lamps.

The Pacific Gas & Electric Company has a five-year contract with the Downtown Association for the initial 110 standards in this section. There is every likelihood that the initial system will be extended in the near future.

J. W. Gosling has also designed a five-light standard, 37 ft. in height, for the civic center. Here there are to be thirty standards of Louis XIV design, harmonizing with the exterior building decorations. Six similar standards will be installed at Union Square.

Thus is San Francisco profiting from the lessons of the Exposition, and planning to be the best-lighted city in America, not merely on the criterion of more light, but of better light. Many of her beautiful building facades, flood-lighted, will be really seen for the first time, while the pavements will be lit in accordance with the latest ideas of the art. The new installation marks an epoch in the history of street lighting. Therefore, a celebration is good and timely.

Five Light, 37 ft. Standard, for Civic Center.

Luminous and Incandescent Standard.

Typical Layout for the Three Light Ornamental Luminous Arc Standard.

A NEW USE FOR CEMENT POSTS.

Concrete and construction companies in California might profitably apply information that is being gathered abroad relative to new cement uses.

Experiments now being carried on in Germany, if successful, may create a market in the Carlsbad district for an American produce. It is proposed to use cement posts in hop gardens for carrying the wires on which the vines grow. Wooden (pine and fir) poles are now used. They are about 8 ft. long and cost 80 cents each. They are treated with a preservative to prevent rot, and their average life is 12 to 15 years.

If these experiments are successful, there will be a field here for the placing of cement machines. Its extent is indicated by the fact that in normal times, in the Saaz district, there is a hop acreage of 30,000, and it is calculated that with the present system of wooden poles, 210 poles are needed to the acre. With the use of concrete probably not so many poles would be needed.

The wire now used costs 8.7 cents per pound, a 24 per cent increase over the price before the war. It is estimated that the poles and wires installed in the hop gardens of the Saaz district represent an investment of more than $3,000,000.

ELECTRIC POWER FOR IRRIGATION PUMPING

DEPARTMENT CONDUCTED BY S. T. HARDING

OPERATION EXPENSES OF CALIFORNIA IRRIGATION COMPANIES.

The proportion of public utility irrigation companies is much higher in California than in the other states where other forms of organization are more usual. Such companies now make annual reports to the California Railroad Commission which show among other things the operation expenditures under various headings as well as the area irrigated and the miles of canal operated. These reports are submitted to the commission by the companies and the distribution is not checked by the commission in detail.

In addition, the commission, either upon complaint or on its own motion, may conduct investigations for the purpose of fixing rates in which both the amount and classification of operation expenditures become subject to review and classification by the commission.

The accompanying tables give the distribution of operating expenses for both classes of cases. These figures are based on total costs compiled in the office of R. W. Hawley, hydraulic engineer of the commission, and supplied by him. Those based on the evidence in actual cases before the commission are much more dependable as they are based on a uniform classification and review of the items. It has been the experience of the commission that there may be more or less confusion in charging maintenance items to capital accounts and vice versa. The annual reports of the companies are also less complete and the basis of segregation not uniform with the different companies.

These figures do not include fixed charges such as interest and depreciation. For irrigation companies the fixed charges usually average about 60 per cent of the total cost of operation.

Distribution of Operation Expenses for Irrigation Companies Based on their Reports to the California Railroad Commission for 1914.

Name of Company.	Per cent of Total Expenses.							Cost per Acre.					
	Salaries—General.	Other—General.	Taxes.	Operation.	Maintenance.	Acres Irrigated.	Miles Canal Operated.	Salaries—General.	Other—General.	Taxes.	Operation.	Maintenance.	Total.
Buena Vista Canal Co	..	24	12	30	34	10720	25	....	$ .09	$ .05	$ .12	$ .13	$ .39
California-Michigan Land & Water Co.	..	61	1	27	11	....	....	....	....	....	....	....	....
Central Canal Co	..	11	6	47	36	44160	33	....	.09	.05	.41	.32	.87
Consolidated Canal Co	22	8	8	17	45	91680	..	$ .10	.04	.03	.08	.20	.45
Cosumnes Irrigation Co	..	1	..	13	86	400	4	....	.03	....	.41	2.60	3.04
Cottonwood Irrigation & Mining Co.	..	..	10	12	78	500	6	....	....	.10	.11	.73	.94
East Side Canal Co	..	20	8	60	12	6351	20	....	.29	.11	.86	.17	1.43
Farmers Canal Co	..	25	2	25	48	7040	3	....	.20	.02	.21	.40	.83
Foothill Ditch Co	..	4	1	57	38	1764	18	....	.16	.04	2.20	1.47	3.87
Fresno Canal & Irrigation Co	14	20	9	..	57	202000	..	.05	.07	.03	....	.20	.35
James Canal Co	..	36	37	21	6	7840	13	....	.08	.08	.05	.01	.22
Kern River Canal & Irrigation Co	..	18	2	47	33	72350	21	....	.03	.0	.07	.05	.15
Madera Canal & Irrigation Co	..	23	..	77	..	6554	133	....	.36	....	1.20	....	1.56
Mokelumne River Power & Mining Co.	..	50	19	31	..	8000	151	....	.71	.28	.45	....	1.44
Natomas Water Co	16	12	23	27	22	5400	29	.29	.22	.42	.49	.40	1.82
North Fork Ditch Co	..	13	19	41	27	5492	51	....	.12	.17	.36	.24	.89
Oro Water, Light & Power Co	15	5	8	6	66	6000	84	.84	.26	.45	.31	3.55	5.41
Pioneer Canal Co	..	25	8	61	6	8320	11	....	.16	.05	.39	.04	.64
Plunkett Canal Co	..	65	35	..	..	1080	4	....	.06	.03	....	....	.09
San Benito Land & Water Co	..	..	6	94	..	2031	30	....	....	.18	2.93	....	3.11
Santa Clara Valley Water Co	..	39	5	25	31	....	10	....	....	....	....	....	....
Stockton & Mokelumne Canal Co	..	40	6	54	..	3425	80	....	.95	.14	1.31	....	2.40
Summit Lake Irrigation Co	..	..	0	100	..	4272	..	....	....	.01	.54	....	.55
Sutter Butte Canal Co	13	38	4	3	42	31500	108	.22	.65	.07	.05	.73	1.72
Sweetwater Water Co	21	21	14	6	38	7080	81	1.36	1.32	.88	.40	2.47	6.43
Yolo Water & Power Co	33	35	5	1	26	9669	85	1.36	1.40	.22	.05	1.02	4.05
Mean	5	23	10	34	28								

Distribution of Operation Expenses for Irrigation Companies Based on the Evidence in Actual Cases Before the California Railroad Commission.

Name of Company.	Per cent of Total Expenses.							Cost per Acre.					Total Cost.	
	Salaries—General.	Other—General.	Taxes.	Operation.	Maintenance and Repairs.	Acres Irrigated.	Miles Canal Operated.	Salaries—General.	Other—General.	Taxes.	Operation.	Maintenance and Repairs.	Per Acre.	Per Mile of Canal.
Coneland Water Co	11	7	6	36	40	7520	100	$ .18	$. 11	$ .11	$ .58	$ .66	$1.64	$124
Murray & Fletcher	12	29	..	35	24	....	86	....	....	....	....	....	....	....
Santa Clara Water Co	24	..	18	58	..	6000	19	.37	....	.27	.86	....	1.50	462
Palermo Land & Water Co	6	15	4	43	32	2400	62	.33	.76	.18	2.13	1.57	4.97	192
Sweetwater Water Co	23	9	..	56	12	4400	82	1.06	.39	....	2.48	.52	4.45	....
Eastside Canal & Irrigation Co	14	10	3	28	45	11000	64	.11	.08	.03	.24	.38	.84	144
Crocker-Huffman Land & Water Co.	15	22	5	23	35	49750	381	.10	.15	.03	.16	.25	.69	91
Soledad Land & Water Co	5	..	2	86	7	800	7	.15	....	.04	2.40	.19	2.78	307
Excelsior Water & Mining Co	63	4	10	19	4	1785	134	4.73	.26	.75	1.43	.34	7.51	101
South Feather Land & Water Co.	24	7	11	23	35	2503	49	.60	.18	.28	.60	.88	2.54	128
Northern Water & Power Co	20	..	9	31	40	....	104	....	....	....	....	....	....	176
Cuyomaca Water Co	16	21	6	23	34	....	86	....	....	....	....	....	....	....
Lone Oak Canal Co	7	4	10	43	36	5500	18	.02	.01	.03	.11	.09	.26	74
Gridley Land & Irrigation Co	6	8	2	40	44	6320	30	.02	.03	.01	.15	.17	.38	80
Foothill Ditch Co	4	10	2	14	70	1100	17	.10	.30	.06	.38	1.99	2.83	183
Pacific Gas & Electric Co	16	15	10	37	22	19000	284	.48	.43	.31	1.11	.67	3.00	201
Mean	17	10	6	37	30									

The most noticeable feature of these figures is the wide variation for different systems. This is to be expected as the conditions of operation and service rendered vary widely. For this reason mean costs are of little value and are not given.

The operation expenses which are those expenditures directly connected with the delivery of water, average 37 per cent of the total operating expenses for those in evidence before the commission and 34 per cent for the cases based on the annual reports of the companies. Operation expenses are the ones most directly affected by the quantities of water used. If rates are based on the quantities of water used, the relatively high stand-by or demand charge is evident, particularly for conditions where the quantity of water used in different years may vary considerably. The proportion of actual total expense including fixed charges would be much less than the percentages given which do not include fixed charges.

Operation costs per acre depend on many factors. Among these are the extent of the service rendered by the company such as whether delivery is made at the heads of laterals or at the individual farm, the compactness of the area served and the proportion of the area covered which is irrigated, the topography of the country, the quantity of water used, the length of operating season, the conditions of maintenance of canals such as the growth of vegetation in the canal or the deposit of silt, the size of farm unit, the frequency of delivery and size of irrigating head used, and the method of delivery whether continuous or rotative. Without knowing these facts for each company the reasonableness of the costs in any case cannot be judged.

The wide variations in the figures for different companies emphasizes the need of a thorough study in each case before fixing rates and the difficulty of judging conditions on one system by the results on another.

The number of miles of canal operated is also given. The costs per acre can be converted to costs per mile of canal from the figures given. In many cases the costs per mile are a better basis of comparison than the costs per acre.

DECISION OF PUBLIC SERVICE COMMISSION OF WASHINGTON ON IRRIGATION RATES.

Complaint against the successors of the Hanford Irrigation & Power Company has resulted in a decision by the Public Service Commission of Washington which involves the question of the proper basis for rates on systems only partially in use and financially unsuccessful.

The case is that of George E. Benford et al., vs. Consumers' Ditch Company, opinion 1959.

The Hanford Irrigation & Power Company was organized in 1906, the project including the development of power on the Columbia River, pumping and conveying water for irrigation to lands in the ownership of the company. Water rights were sold with these lands. In 1913 the company went into the hands of a receiver and the property was sold at public sale in March, 1915. The purchaser organized three companies to handle the irrigation system, the power and pumping plants and the remaining land, respectively. The capital stock of the Consumers' Ditch Company was $10,000. For the canal property and $5000 in cash, the ditch company gave its capital stock. The rates specified in the original water contracts were $1.50 to $2.50 per acre. There was also a provision that these rates should not be changed before 1913 and thereafter the rates should be established by the company. A rate of $7 per acre was established by the company in 1915.

The sale price was taken as the value of the system. Regarding this the opinion states:

The complete failure of the Hanford Company, the sale price at receiver's sale of its property, and the purchase price of $5000 in stock paid by the present owners, seems conclusive evidence that the fair value of the irrigation plant was not, and is not, anything near what the property cost the Hanford Company. Particularly is this apparent when consideration is given to the value of the irrigation plant, disassociated from the land and power advantages sold with and as a part of the irrigation project. In any event, the present owners have invested in plant and working capital only $10,000 in capital stock. We are of the opinion that the sale price in this transaction may be taken as the fair value without any disregard of the property rights of the present owners. The original cost cost of reproduction, etc., may be used as a guide in making proper allowances for depreciation, and in this regard will have consideration in the rate. In viewing the value of the rrigation plant alone the company can claim no injury by having the commission accept as the fair value the sale price, and we doubt very much if the irrigation plant could be sold on the market today for the price whch Mr. Lyons evidently received when he sold it to one of his own corporations.

Of the 6300 acres of irrigable land under the system only 3646 were actually being irrigated, the remainder being in the ownership of the subsidiary land company whose ownership was the same as that of the ditch company. Maintenance and fixed charges were pro-rated to the full 6300 acres, operation cost to the area actually irrigated. The cost of pumping, based on the charges made for pumping by the power company was 50c per acre foot. The lift was not stated. The contracts were for 32 acre inches of water per acre per year. Allowing 40 per cent distribution loss, as found by the commission, the rate for pumping for 32 acre inches per acre was found to be $2.22 per acre. A rate of 10c per acre inch was found for water in excess of 32 acre inches. For 32 acre inches the rates fixed totalled $4.66 per acre. Operation, maintenance, taxes, office and general expenses, was $1.59 and fixed charges, including investment and depreciation, $0.85. The interest was fixed at 8 per cent on the valuation of $10,000, or a total of $800 per year. The depreciation based on physical value totalled $4532 per year or 45 per cent of the valuation found.

Some of the reasoning used by the commission is given in the following extracts:

The Consumers' Ditch Company owns no water, and has no water that it can sell. To its predecessor, the Hanford Company, may be applied the same statement. It is selling service. The water appropriated is for its own use or the use o fthe public, and in its relation with the public it is performing a service for which it may be entitled to compensation.

The original investment in this enterprise was undoubtedly made for the joint benefit of the company and for the public. The Hanford Company apparently expected to get returns from the service rendered, and also from the sale of

its irrigable lands at enormous prices, and it should not be assumed now that the rate paying public must carry the burdens of the investment made for the purpose of increasing the sale value of the company's land. It is apparent from the record that the original investment was made on the basis of irrigating so many acres of land, and thereby increasing the value. On this basis the expenses and fixed charges may be pro-rated according to the acreage susceptible of irrigation for which the plant was built. The investment in, and the maintenance of, the plant undoubtedly enhances the value of every acre for which the plant was constructed. It therefore seems unfair for the company to expect those who purchased part of the land to bear the full burden of maintaining the plant, especially in view of the fact that about the only element of value in the land is on account of its susceptibility of irrigation under the irrigating plant.

It seems only reasonable and just that in maintaining the plant and operating the same all the land under the ditch should stand its pro rata of expense. To expect that the few struggling purchasers should maintain the entire plant built as much for the Lyons land as for that of the purchasers is not within the bounds of reason.

The charge for operation, $2,986.78, is practically the same as that for maintenance, $2,705.84. If these charges are distributed on the basis of the acres now actually irrigated the charge per acre will be more than it should be, and we will, therefore, make the distribution of "operation charge" to the acres actually irrigated, and the "maintenance charge" will be distributed over the irrigable acres.

SUGGESTIONS FOR BOOKING SOUTH AMERICAN TRADE.

Engineering and construction companies seeking connections in South America will do well to follow the general advice given through the consular offices for exporting cotton goods to that region.

There are three general methods of getting in touch with the cotton goods importers of this district; through traveling salesmen, sent from the United States, through local representatives, and through correspondence. The best way to obtain and then hold the Paraguayan trade in cotton goods would be by a combination of the first two methods—that is, introduction of the goods by a traveling salesman who would appoint a local representative here.

If a traveling salesman is sent to this district there should be a clear understanding between the salesman and his principal as to the extent of the salesman's authority. This is mentioned here in view of the fact that a salesman representing American cotton goods houses recently visited this market and succeeded in booking orders for a considerable amount of goods. In several cases he allowed terms of 30 to 60 days to large and reliable firms. These firms have since received notice from this salesman's principals that they are unwilling to comply with the terms allowed by their representative and request cash in advance. Incidents like this cause very unfavorable criticism of American business methods.

Great care should be exercised in the choice of a local agent, as the selection of the wrong man will be harmful to his principal and to American business in general. Cases have come to the attention of this consulate of agencies offered to persons here where no investigation of their standing or ability had been made.

SKIN EFFECT WITH IRON AND STEEL CABLE.

BY CLEM A. COPELAND.

(This article concludes the series on skin effect. Curves for determining skin effect of stranded steel cables are shown and general conclusions are reached regarding their use.—The Editor.)

Passing to the subject of cables, it appears that the qualities partake very much of the qualities of the individual strands.

This appears from Figs. 8 and 9 although much experimental data is needed in this connection.

Recently some curves for ¼", ⅜" and ½" cables have been experimentally obtained but unfortunately the methods of testing introduced a severe "proximity effect," the cables being saturated by the return conductor, rendering the results of use only under the identical conditions of the test. Incidentally these curves illustrate one method of reducing $\mathbf{K}_R$ to very small values.

It is therefor perhaps superflous to add that all of the curves in Figs. 13 to 26 in the present paper do not consider the "proximity effect" and may only be safely used where $\mathbf{A}_{in} > 125\ r_1$. When the "proximity effect" is present the phenomena are so complex that an individual experiment must determine $\mathbf{K}_R$ and $\mathbf{K}_L$ in each case.

Fig. 25 is prepared showing how curves may be constructed for 7-strand cables of various sizes at 60 cycles.

For 50 cycles the similitude to curves for solid wires may be used in the absence of more accurate data.

The maximum values of $\mathbf{K}_R$ may be obtained by using the top scale of areas and the straight lines while the maximum points on the ($\mathbf{K}_R$, $\mathbf{I}$,) curves lie upon the long-dash curves. Four curves for ⅜ in. 7-strand cables have been constructed as an example.

In a similar manner the construction for curves of larger cables of more strands is shown. In Fig. 26 a curve for a 19-strand "plow-steel" or other high strength steels has been drawn in as an illustration. This figure should be used with caution, as it lacks experimental verification, but is as near correct as the state of the art admits at present. It shows that a resistance at 50 or 60 cycles, and at 250 amperes of $1.65 \times .215 = .355$ ohms per 1000 ft, may be expected when the area is .49375 sq. in.

It is instructive to note that the higher the tensile strength the less difference there is between the 50 and 60 cycle curves so that Fig. 26 may be used probably with equal accuracy for both frequencies.

At the high tensile strengths the specific resistances vary much less with a given change in tensile strength than with softer irons, so that Fig. 26 may be used for all steels above 80,000 lb. per sq. in. in strength.

Having at hand the physical characteristics of iron and steel conductors the question is, when does it pay to use iron and steel. The general impression exists that iron is cheaper than copper, especially at the present time when copper is worth a third of a dollar a pound. The curves show that this depends on the current but in nearly all cases for the same ohmic resist-

ance iron is more expensive than copper and nearly always has been. At the present time a 7-strand iron or steel cable is more expensive than a single copper conductor for the same resistance, while the comparison with single iron and steel wires is not favorable to the permeable materials.

The economic application of iron wires lies in their high tensile strength, allowing the supports to be a greater distance apart. A notable example is the 19-strand, 7/8 in. plow steel cable spanning the Carquinez Straits, 4427 ft. between supports, belonging to the Pacific Gas & Electric Company.

For small currents, high voltage lines transmitting small amounts of power, short leads and services, and uses involving tensile strength particularly are economic applications of iron and steel conductors.

It is hoped that future experiments will be made especially on steels having a tensile strength of from 80,000 to 250,000 lb. per sq. in., and on various conductors at low currents and high frequencies stranded

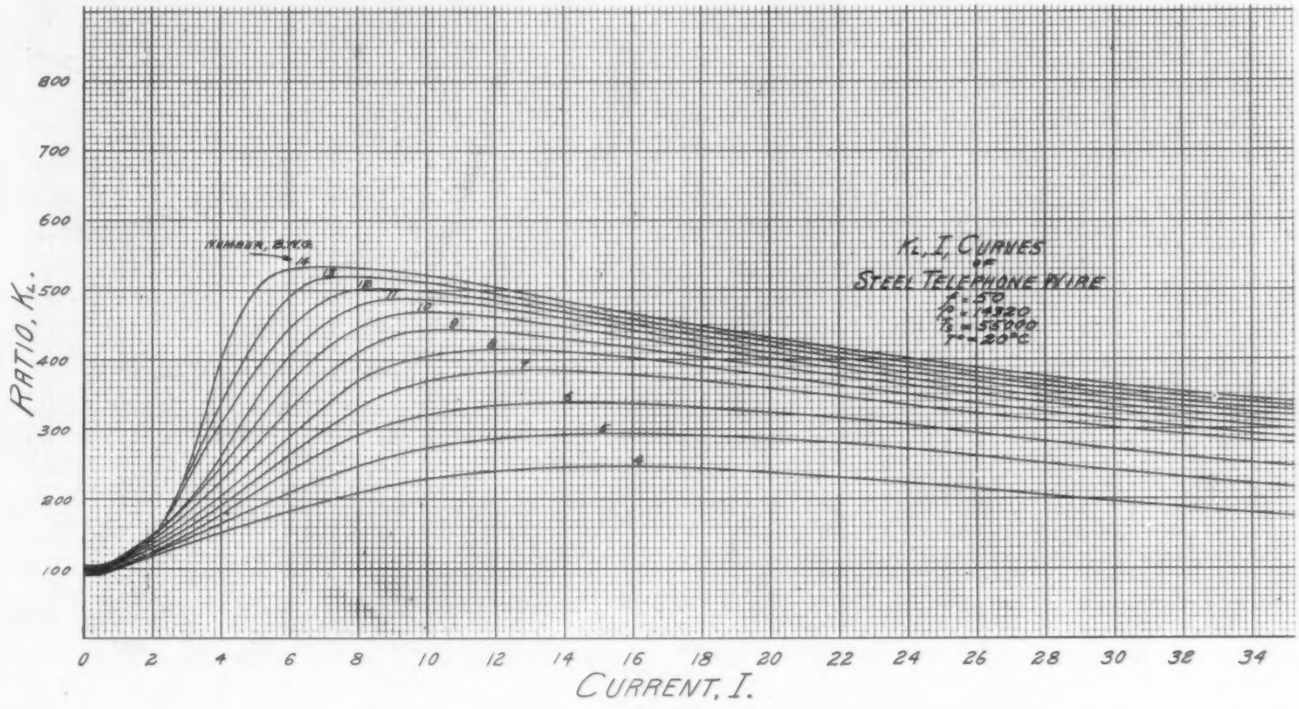


Fig. 24.

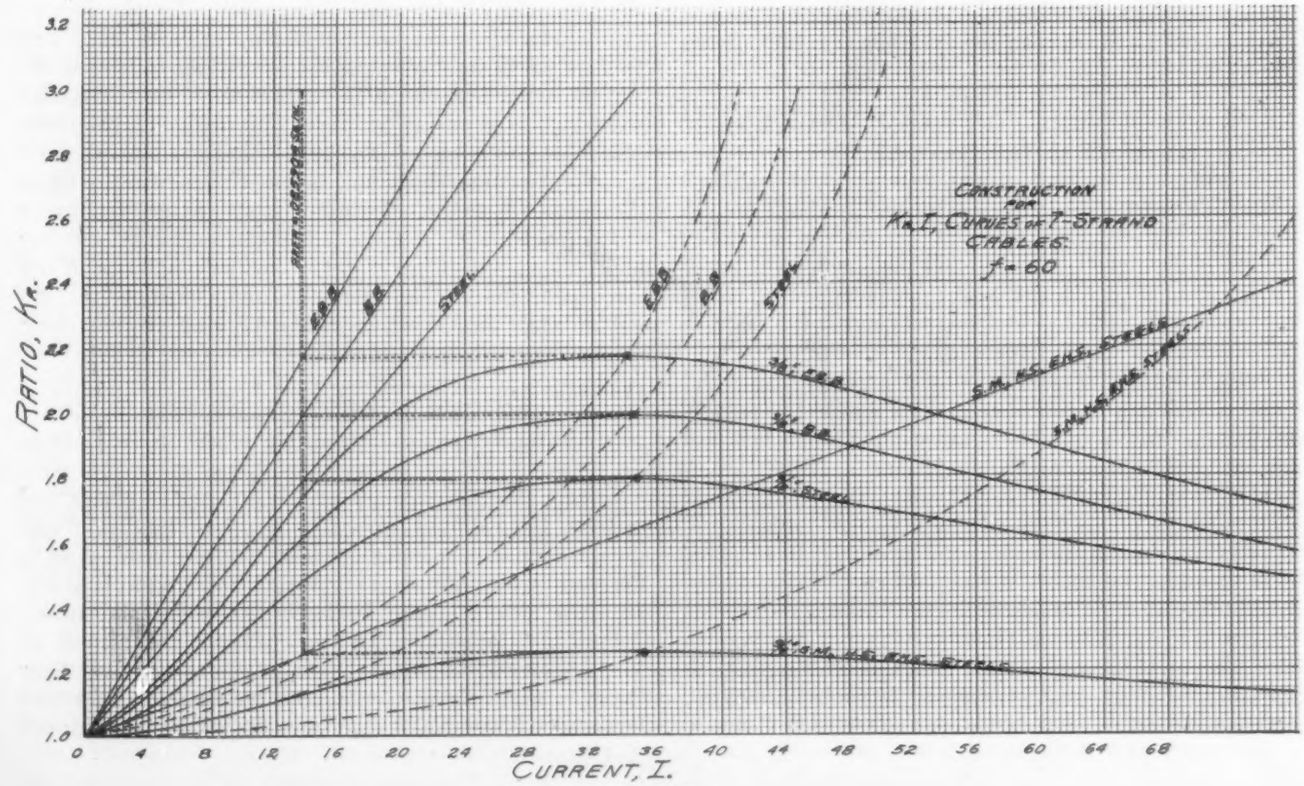


Fig. 25.

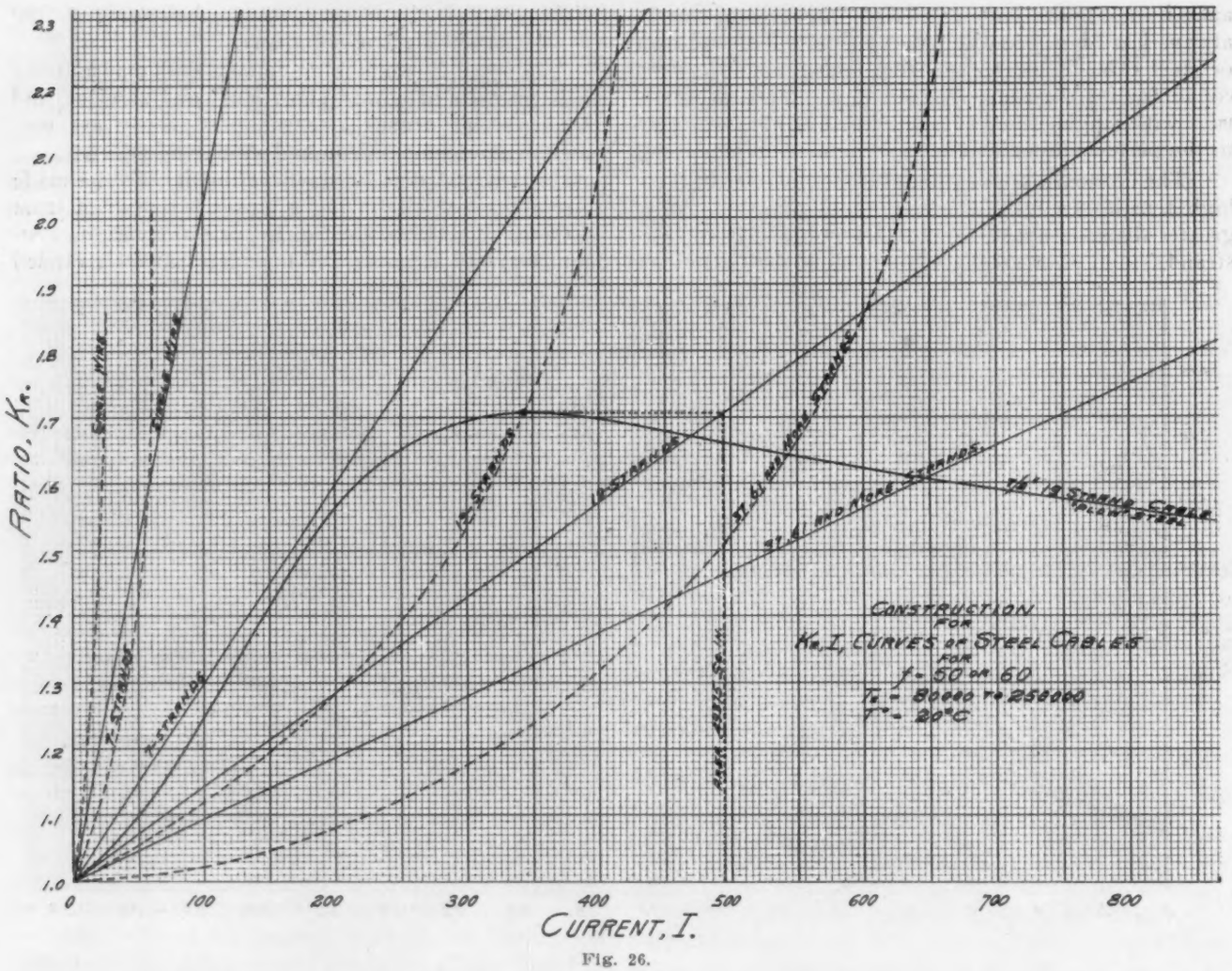


Fig. 26.

cables should be investigated in a thorough manner. The safe carrying capacity of all iron and steel wires and cables are also desired.

PLANS ANNOUNCED FOR WORK UNDER FEDERAL AID ROAD ACT.

Secretary Houston has just announced the plan to be pursued in spending the ten million dollars appropriated by the Federal Aid Road Act for the construction and maintenance of roads and trails within or partly within National Forests, and has tentatively allotted among the various National Forest States the million dollars which is expendable this fiscal year.

The tentative allotments to the principal National Forest States are as follows: Alaska, $46,280; Arizona, $59,795; Arkansas, $11,294; California, $140,763; Colorado, $62,335; Idaho, $108,010; Montana, $69,901; Nevada, $19,195; New Mexico, $42,622; Oregon, $127,794; South Dakota, $8,115; Utah, $40,982; Washington, $91,739; Wyoming, $40,566. In addition, a total of $9552 has been tentatively assigned to Florida, Michigan, Minnesota, Nebraska, North Dakota and Oklahoma, while the Eastern States—Maine, New Hampshire, Virginia, West Virginia, North Carolina, South Carolina, Tennessee and Georgia—in which the government is purchasing lands for National Forests, have been allotted $21,057.

The method followed in apportioning the money was explained by Secretary Houston as follows: Ten per cent of the amount available each year will be withheld as a contingent fund. One-half of the remainder will be allotted to the States in amounts which will be based on the area of National Forest lands in each State. The other half will be apportioned on a basis of estimated value of timber and forage resources which the Forests contain. Amounts apportioned but unexpended within three years, and any balance of the contingent fund which remains unapportioned at the end of each year, will be reapportioned on the same basis as the original allotments.

POWER SURVEY ORDERED.

Development of hydroelectric power on the Columbia, Snake and Clearwater rivers is made possible with governmental aid through provisions of the rivers and harbors bill, signed recently by President Wilson. Under section 2 of the act the Secretary of War is directed to provide for a survey of the Columbia River from the mouth of the Snake River to Priest Rapids; Columbia River from Celilo Falls to the mouth of Snake River; the Snake River to Pittsburg Landing, Idaho, with a view to the construction of locks and dams for navigation; Clearwater River from its mouth to Orofino.

SPARKS—CURRENT FACTS, FIGURES AND FANCY

The census of 1910 shows a total of forty-five thousand draftsmen and designers in the United States.

* * *

Mica has physical properties which render it of value or indispensable in several industries, such as the manufacture of electrical machinery and apparatus, the glazing and decorative trade.

* * *

Here is something to ponder over. Japan has a Red Cross membership of one million eight hundred thousand, while here in America our enrollment totals scarcely one hundred thousand.

* * *

In 1915 mining companies in the northwest paid in dividends over ten million and a half dollars. This year at the present monthly rate dividend paying will exceed thirteen and a third millions.

* * *

American capital is trending southward. A recent loan of five million dollars has been made to the city of Bogota, United States of Columbia, by the American International Corporation of New York City.

* * *

Ninety per cent of the registration and license fees paid in the United States in 1915 by automobilists to the different states or $16,213,387, was spent for the building and maintenance of county and state roads.

* * *

To illustrate America's rapid growth in trade with the Orient, take the instance of shipments in rice from Hong Kong for the first three months over several years, in 1912, $359,180; 1913, $578,699; 1914, $490,853; 1915, $548,799; 1916, $1,080,555.

* * *

Americans frequently fail to appreciate the size of Australia and its number of people. This great continent has an area of nearly three million square miles and a population of over five million people, almost wholly of British origin.

* * *

The electrical industry on the Pacific Coast is not only fast becoming a coherent enthusiastic unit in itself, but now the household furnishing stores interested in the sale of electric appliances are being drawn into harmonious activity with the electrical contractor dealers.

* * *

A San Francisco boy recently won the national contest for the America's week electrical display over hundreds of competitors. And now a San Francisco boy has secured patents on an improved X-ray apparatus which bids fair to introduce new and extended uses of this valuable apparatus. Next?

For sometime past inventors and others interested in lowering costs of husewiring have devoted much time to the subject. The concentric cable proposed for wiring already-built houses has proved a disappointment and many of the local electrical organizations are passing resolutions against its use.

* * *

The National Wholesale Grocers' Association advocates that its company members hereafter print on the labels of the canned and boxed goods not only the weight in English units but also the metric equivalent. It's time all were waking up to the simplicity of the metric system before the newly-opened American world commercial opportunities force us to do so.

* * *

Due to the high price of copper wire it is proposed that soft steel conductors be used for housewiring wherever possible. Such a wire would have about seven times the resistance of a copper wire of the same cross-section, and in small sizes the magnetic permeability would be of no consequence in alternating current circuits of commercial frequencies, so far as reactance and skin effect are concerned.

* * *

There will be housed on the electrically propelled superdreadnaught Tennessee, now under construction, over thirty-seven thousand electrical horsepower. Sufficient power in fact to supply the inhabitants of a modern city of about 100,000. If Hercules had had the task of cleaning the stables for such an outlay of horses as represented in this power, the greatest of all of his famous labors would still be unchronicled.

* * *

Consular reports show that the war has affected the world's business in the following manner. Business activities were fairly normal in the various countries of the world during the two years preceding the outbreak of the war. The period of business depression following the outbreak of the war lasted from four to six months. By April, 1916, however, the United States had entered upon a period of business activity unparalleled in the history of the country.

* * *

When our supply of German porcelain was cut off with the outbreak of war in Europe our chemical industries, and especially our chemical laboratories, were hard hit. Today, however, American pottery manufacturers are producing in their own works through their own skill and ingenuity porcelain the equal of any produced in Germany. This is one of the achievements of American chemistry which will be demonstrated during Chemical Week at the Chemical Exposition in New York, September 25 to 30.

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The Service Department

One of the most commendable features of modern public utility operation is the maintenance of an effective, courteous service department. Indeed upon the efficiency of this department often rests the final opinion for good or for bad held in the public mind concerning the usefulness of a public utility company.

So effective has the service department of the utility company been recognized that now the manufacturer and the jobber are beginning to establish service departments. While much expenditure of time and money is necessary to carry on an up-to-date service department still there is nothing that pays greater dividends.

The purchaser of an electric appliance for instance often finds some little kink that he himself cannot unravel and a timely word of advice will do wonders in making him boost for the apparatus when speaking to his friends. Such missionary zeal as this with which the purchaser becomes imbued speaks unconsciously a forceful sales campaign that brings in new business as nothing else will.

The great poet Milton, when blind in middle age, found comfort in his enforced idleness by writing the immortal lines "they also serve who only stand and wait." This waiting attitude on the part of a wide-awake service department, ever ready for action when occasion demands, but quiet, courteous and unobtrusive when not needed, brings big returns for the utility company, jobber, or electrical contractor dealer. There is nothing in human nature that appeals deeper to the emotions nor moves to action quicker than a realization of a kindly interest that is being shown in one's success or accomplishments on the part of others, especially from those of whom it is least expected.

Hence the strong conclusion is to be drawn that success in modern business affairs is largely attained through the courteous, attentive efforts of the service department.

The Perfect Electric Water Heater

In the present active campaign that is being made to equip the modern American home throughout as an electrical palace, inventors are alert in all quarters in an effort to displace by electrical means the present methods of heating water for household purposes.

Although scientists have spent over a hundred years since the days of Joule in establishing beyond cavil the fact that heat is one form of energy whose units bear a fixed ratio with other units of energy, still even in this enlightened day inventors claim to be perfecting electrical devices for heating water in such amounts as would represent more energy imparted to the water than is supplied in the electric circuit that energizes the electric heater.

There is perhaps no other ratio more thoroughly and accurately established in modern science than the fact that a British thermal unit of heat energy is equivalent to 777.5 ft. lb. of mechanical energy and that one horsepower hour is equivalent to .746 kilowatt hours.

Using these unit ratios, it at once follows that a kilowatt hour of electrical energy is equivalent to 3412 British thermal units of heat energy. Assuming that

one gallon of water weighs 8.33 lb., we find at once that 3412 British thermal units will raise 4.09 gallons of water 100 degrees in temperature. In other words were an inventor to perfect an electrical water heating device with no wastes or losses at all, the best he could hope to accomplish would be to raise say four gallons of water to one hundred degrees increase in temperature for every kilowatt hour of electrical energy applied.

On a three-cent rate it is at once seen that even the perfect electric device could not heat water at a better figure than 0.750 cents per gallon heated one hundred degrees.

On the other hand let us see what the modern perfect gas heater could accomplish. A cubic foot of gas contains about six hundred British thermal units. Hence every thousand cubic feet contains 600,000 heat units. With gas at eighty-five cents per thousand this means that the perfect gas heater could raise a gallon of water one hundred degrees in temperature for a cost of 0.118 cents. Thus it is seen that the gas rate of 85 cents as opposed to the electric rate of 3 cents will heat six and one-half times the water for the same outlay in money, assuming that the heaters operate under the same efficiency factors.

It is not true, however, that gas heaters can be made to operate as efficiently as an electric heater. It is a well-known fact that gas water heaters as a rule seldom exceed fifty per cent efficiencies as compared with electric heaters which commonly run from eighty-five to ninety per cent. Indeed it is generally conceded that the modern gas range operates at as low as twenty-five per cent efficiency.

It is these low efficiencies which it seems impossible to better that make possible the early triumph of cooking and heating by wire.

Western hydroelectric companies are recognizing this disparagement in figures and as a consequence rates under a half-cent per kilowatt hour are being granted for electric heaters operating on the storage systems. Such rates where practicable to grant are doing wonders in winning over new electrical loads that will be enduring and at the same time loads that present ideal conditions for hydroelectric plants.

The Twenty-Million Dollar Nitrate Plant

Those interested in the development of huge water powers in the West for the manufacture of nitrogenous products will continue to follow with keen interest the discussion that is going the rounds in governmental circles as to the best place to locate the proposed twenty million dollar nitrate plant provided for recently by Congress.

The President has turned over the consideration of the matter to the Secretary of War, who has asked the Academy of Science to aid in determining which method of electrical fixation of nitrogen from air is the most practicable for the purpose of this plant that is to manufacture munitions in times of war and nitrogeneous fertilizers in times of peace.

In investigations undertaken thus far two sites have been prominently mentioned—the power development at Keokuk, Iowa, and the proposed power development on the Priest Rapids of the Columbia. The former is at once eliminated due to its ability to dispose of its power at a figure beyond that at which fixation of atmospheric nitrogen is commercially feasible. The latter—a promising prospect—has been eliminated due to a ruling of the War Department which sets forth that the site must be chosen somewhere between the Rocky and the Allegheny Mountains and under no conditions to be within 200 miles of a seaboard or border. This ruling affects not only the Priest Rapids proposed development but, indeed every other Western water power possibility. In other words this ruling eliminates over two-thirds of the possible hydroelectric developments in the United States.

Undoubtedly the ruling is a wise one, however, and one that all loyal and patriotic citizens should support, for in times of war the munitions plant should be well within the interior and protected as far as possible by all natural barriers of distance and configuration of country that may be reasonably brought to bear.

Seeing that the West is thus eliminated, a splendid opportunity is thereby given for all western observers to view the procedure of this undertaking from an absolutely unbiased and truly patriotic viewpoint.

The one feature that will perhaps result from this plant's being located east of the Rockies will be the early appearance of privately owned nitrogenous hydroelectric plants on the Pacific slope.

The government thus taking the lead in hydroelectric development for fixation of atmospheric nitrogen will unquestionably thereby create a confidence that has hitherto been lacking in enterprises of this sort in the Americas although European countries have for some years past reaped an enormous harvest from artificial nitrogenous products. Indeed it might be safely said that the foresight of Germany in fostering this industry has been the life-saving element of her present colossal defense.

The ultimate application of the gigantic powers of the West in the development of electrochemical industries has long been the dream of all well-wishers for the harnessing of these great natural resources.

It would seem that the building of this great twenty million dollar nitrate plant, while barred from Western location, will as a matter of fact do more toward immediate encouragement of this development in the West than any other single advance in recent years.

During the past several months engineers all over the United States have been engaged in gathering a voluntary patriotic inventory of the industrial activity of the nation for the use of the United States Naval Consulting Board. When the time does arrive for the development of Western waterpowers for electrochemical industries the preparedness of the nation will be vastly advanced. It is none too early for some preliminary action to be taken by the government in encouraging these activities with this very end in view. Such encouragement would mean much in getting these industries started and when in operation a certain sense of security is bound to be felt throughout the nation and yet as a move for a peace-loving nation no better activity could be initiated than one which seeks to put the natural resources of a country to grinding out fertilizers to replenish the soils and new electrochemical industries to build up the industrial strength of our Western Empire.

PERSONALS

J. M. Chamberlain, of the Fobes Supply Company, has returned to Portland from a brief trip to California.

H. F. Holland, Pacific Coast representative Simplex Electric Manufacturing Company, is at Seattle from Los Angeles.

F. H. Poss. western representative of the Benjamin Electric Company, has been at Los Angeles during the past week.

John F. Alden, president of the Locke Insulator Company of Victor, New York, was at Salt Lake during the past week.

Harry S. Whitney, president of the Pierson, Roeding Company, has just returned from a business trip to Salt Lake City.

H. B. Carter, formerly of the Pacific States Electric Company, has just returned from a sojourn at Newport Beach.

C. G. A. Baker, vice-president and secretary-treasurer of Baker-Joslyn Company, has returned to San Francisco from Los Angeles.

F. H. Leggett, manager of the San Francisco office of the Western Electric Company, left August 29th for a five or six weeks' trip in the East.

F. D. Weber, Portland correspondent of the Journal of Electricity, Power and Gas, has left his offices in Portland for a two weeks' vacation.

A. V. Guillore, representing the Pacific Light & Power Company, Los Angeles, is in temporary charge of the Mt. Whitney Power Company at Visalia.

Richard A. Cooke, president of the Hawaiian Electric Company, Ltd., Honolulu, and wife, are on a visit to San Francisco. They are at the Clift Hotel.

G. Sherman, stores manager of the San Francisco office of the Western Electric Company, has just returned from Los Angeles where he has been for the past week.

H. T. Carlton, of the Rieber Laboratories, San Francisco, will go East September 13th to attend the American Roentgen Ray Society convention at Chicago in the interests of his company.

Dwight B. Deane, manager of the Pullman Car plant at Cleveland, of the J. G. Grille Company of Philadelphia, was in San Francisco during the past week and left for the East Monday.

Carl Young, general manager Illinois Electric Company, has returned from a three weeks' business trip through the East, visiting the main office at Chicago and attending the lamp conference at Cleveland.

W. S. Berry, sales manager of the San Francisco office of the Western Electric Company, leaves September 10th for Portland and Seattle. He will also attend the Jobbers' meeting at Hayden Lake, Idaho, September 21-22-23.

Miles F. Steele of the Benjamin Electric Company of San Francisco, left Chicago this week for the Northwest. He will attend the conventions at Seattle and Jobbers' convention at Hayden Lake before returning to San Francisco.

F. S. Mills, supervising engineer for the National X-ray Reflector Company of Chicago, Ill., has recently moved into new quarters at No. 234 Bankers' Investment Building, San Francisco, with Los Angeles offices at No. 1132 Citizens Bank building.

A. H. Halloran, vice-president and managing editor Journal of Electricity, Power and Gas, is at Seattle, where he has been attending the conventions of the American Institute of Electrical Engineers and the North West Electric Light and Power Association.

Frank Killam, of the sales department of the Pacific States Electric Company, has just returned from his vacation. He tells quite a thrilling story of following a bear all night. How far up the tree either he or the bear were is not stated, but his being here to tell the story is proof positive that the bear didn't kill him.

G. A. Schneider, Western Electric power apparatus specialist, leaves on September 11th for the Western Electric Power Apparatus Conference to be held at Chicago, Ill. During his trip he will also visit the factories at Ft. Wayne, Schenectady, Boston and Lynn, Mass., in addition to visiting the Western Electric factory at Hawthorne, Ill.

Frank Rieber, chief engineer of the Rieber Laboratories, San Francisco, is contemplating a trip to Chicago and New York the latter part of the month. During his visit east Mr. Rieber will exhibit at the meeting of the American Roentgen Ray Society in Chicago his new 120,000 volt direct current X-ray generator, a recent invention of his laboratories.

W. S. Heger, Jr., formerly with the Busch-Sulzer Diesel Engine Company, has just returned to San Francisco from Milwaukee where he motored with his wife and family in a Buick car, making the trip east in nineteen days and returning in eighteen days. He was presented with a silver cup from the Buick company. Mr. Heger returned with several agencies in the electrical line and will establish headquarters in San Francisco.

E. C. Bennett, Syndicate Trust Building, St. Louis, Mo.; **F. H. Gale,** General Electric Company, Schenectady, N. Y.; **W. J. Crambs,** Puget Sound Traction, Light & Power Company, Seattle, Wash.; **A. A. Gray,** Electrical Review and Western Electrician, Chicago, Ill.; **C. H. Hodskinson,** Edison Electric Illuminating Co., of Boston, Boston, Mass.; **Ray D. Lillibridge,** 111 Broadway, New York City; **J. C. McQuiston,** Westinghouse Electric & Manufacturing Co., East Pittsburg, Pa.; **A. H. Manwaring,** Philadelphia Electric Company, Philadephia, Pa.; **S. M. Kennedy,** Southern California Edison Company, Los Angeles, Cal.; **H. N. Sibbald,** National Quality Lamp Division of G. E. Co., Cleveland, Ohio; **Edward B. Strong,** Journal of Electricity, Power and Gas, San Francisco, Cal.; **Alan Sullivan,** Toronto, Ontario, Canadian Electrical Association, 910 Excelsior Life Building, and **Geo. W. Elliott,** Orienta Point, Mamaroneck, N. Y., as chairman, have all been appointed by H. A. Wagner, president of the National Electric Light Association, to serve on the transportation committee during the coming year.

OBITUARY.

Samuel H. Weidenthal, manufacturer of electrical appliances at 623 Mission street, went into the basement of his home, 183 Jordan avenue, August 31, to lock the windows. He was found later, dead upon the floor. Heart disease was the cause.

NOTES ON UNIVERSITY EXTENSION IN CALIFORNIA.

The purpose of University Extension is to assist those who are unable to undertake a formal course of study in a school, college or university, but who desire to begin or continue their studies in a definite and systematic manner. In the University of California the work is organized as a division carried on through seven bureaus, namely, a Bureau of Class Instruction, a Bureau of Correspondence Instruction, a Bureau of Lectures, a Bureau of Public Discussion, a Bureau of Information, a Bureau of Municipal Reference, and a Bureau of Visual Instruction.

The Bureau of Class Instruction organizes and conducts classes when a sufficient number of persons are willing to join in the study of some single subject, and provides instruction for such classes. Its work approaches in method, and so far as possible, in character, the class work of the university itself. The instruction provided is not limited, however, to university courses.

There is no requirement for admission to a class, save the ability to pursue the work with profit. The fee for a course of fifteen lessons is $5.00. This must be paid at the

time of enrollment. No fee will be refunded except in case of the discontinuance of a class. All persons who desire to join extension classes should register either in person or by mail at either the San Francisco or the Berkeley office of the Extension Division.

Plan of Organization.

1. The Bureau of Class Instruction organizes and conducts classes in cities and towns wherever a sufficient number of people can be secured who wish to study the same subject. Instruction is offered in languages, literature, public speaking, mathematics, political science, business branches, economics, technology and other subjects.

2. The Bureau of Correspondence Instruction offers instruction by mail in the languages, in literature, mathematics, music, drawing, education, political science, geography and business subjects. Courses may begin at any time.

3. The Bureau of Lectures provides lectures singly or in series of six or twelve for any committee, club, organization, or community in the state that will make the necessary arrangements.

4. The Bureau of Public Discussion promotes and directs interest in the study and discussion of public questions by assisting in the organizing and conducting of "debating clubs" and "discussion centers"; by publishing bulletins of value to beginning public speakers; by co-operating with the libraries of the state in recommending material for study; and by conducting the Interscholastic Public Speaking League of California—a state high school debating organization.

5. The Bureau of Municipal Reference is a clearing house for inquiries and information concerning municipal government and administration. It collects from books, public documents, etc., and from competent authorities in administration, finance, public health and allied subjects, knowledge bearing upon the solution of municipal problems, and distributes it throughout the state. It is allied with the League of California Municipalities.

6. The Bureau of General Information answers inquiries, of whatever nature, addressed to it or referred for answer by the various departments of the university, or by individuals of the faculty.

7. The Bureau of Visual Instruction collects and circulates stereopticon slides, motion picture reels and exhibits. These cover practically every phase of educational work, but chief attention has been given to industrial subjects. They are sent in rotation through the schools of the state and are studied by public schools as a part of the curriculum and by parents and citizens as a feature of community service.

THE STRAWBERRY DROP-FILLED DAM.

The article on the above subject in the issue of this journal, dated September 2d, failed to give credit to the firm of Ford, Bacon & Davis, of New York, New Orleans and San Francisco, who prepared the plans and specifications of this dam and served as consulting engineers. This firm also acted as consulting engineers to the Valier-Montana Land & Water Company for the Birch Creek drop-filled dam containing 216,000 cubic yards of rock in excavation. The Strawberry Dam, and the Birch Creek Dam are thought to be the largest dams of this type in the world.

THE HOOSAC TUNNEL ELECTRIC LOCOMOTIVES.

The Hoosac tunnel of the Boston & Maine Railroad is the largest electrified tunnel in America. The work of digging the tunnel was started in 1831 and completed in time for the first steam train to pass through on February 9, 1875. It is 25,081 ft. long and is double tracked throughout. Until its electrification in 1911 it was always an obstructing feature to the traffic of this railroad. Under steam operation the entire tunnel was a block, only one train at a time being allowed to pass through. Under electric operation several trains are permitted in the tunnel. The electrification, which is of the Westinghouse single-phase system, has been entirely successful in operation, proven by the ease with which the heavy freight traffic of the road has been handled. Freight trains are no longer packed three or four deep at each portal waiting for a chance to get through.

As many as 77 trains a day pass through the tunnel and regularly 71 trains pass through every 24 hours. Of these about 17 are passenger trains, the remainder freight.

NEW BULLETINS AND CATALOGUES.

The city of Portland, Oregon, has just issued an electrical code containing 180 pages of loose leaf matter relative to electric wiring and installations within its corporate confines.

The Hemingray Glass Company has just issued Catalogue No. 29. This catalogue is practically a reissue of Catalogue No. 28, with reduced outline cuts and of the regulation 8 by 10 size punched for the loose leaf sales book. The catalogue will be supplied free upon request.

The Cutler-Hammer Manufacturing Company has just issued an attractive leaflet setting forth the philosophy of "Petey Dink" with apt reference to the electric gear shift manufactured by that company.

The U. S. Bureau of Mines in its Bulletin 116, just issued, describes in detail methods of sampling delivered coal and gives specifications for the purchase of coal for the government. The purchase of coal by the government under specifications depending on the heating value of the coal, its content of ash and of moisture, and other considerations, rather than upon the reputation or trade name of the coal, was based on the fuel investigations begun by the Technologic Branch of the United States Geological Survey in 1904. The plan was first adopted by the Treasury Department in 1906. Since then the plan, variously modified in form, but the same in principle, has been gradually adopted by other departments until, at present, of the coal used by the government, the total value of which approximates $8,000,000 annually, more than half is purchased under specifications. The government publications dealing with the adoption by the government of the specification plan, the number of contracts awarded on that basis, and the quality of the coal delivered under such contracts in the several fiscal years covered by the reports are given in publications listed at the end of this bulletin. This bulletin should prove very useful and helpful to those engaged in the purchase of coal for central stations.

TRADE NOTES.

The Electric Construction Company of Oakland, Cal., have been awarded the contract for the electrical work in the new Hall of Records in Oakland.

The McGlauflin Manufacturing Company, manufacturers of eucalyptus insulation pins, brackets and pole steps, have removed their factory from Sunnyvale to San Rafael, Cal.

The Edison Storage Battery Supply Company announces the opening of their Los Angeles office, fourth floor San Fernando building, Fourth and Main streets. James F. Rogan is resident manager.

The Snoqualmie Falls Lumber Company, of the Weyerhaeuser interests, who are building a large saw mill at Snoqualmie Falls has just closed a contract with the Seattle office of Allis-Chalmers Manufacturing Company at Milwaukee, Wis., for what will be the largest steam turbine and condenser ever installed in a saw mill. The unit, which is of the Parsons type, will generate 4000 kilowatts continuously, which is equivalent to 6000 h.p. The power will be supplied by a battery of Sterling water tube boilers. The entire mill will be operated by electric motors and the logging will also be done electrically. Saw mill refuse will be burned under the boilers to generate the steam.

NEWS NOTES

FINANCIAL.

SALEM, ORE.—The net income or profits of the Eastern Oregon Light & Power Company for the year ending June 30, totaled $21,659.10, according to the annual report filed today with the public service commission. Net operating revenues were $198,544.78, operating expenses $84,081.81, and net operating revenues $114,462.97. The surplus at the beginning of the fiscal year was $143,480.10, and to this was added $13,187.87 June 30. The Rogue River public service corporation sustained a net loss of $16,629.79 during the year ending June 30. The deficit at the beginning of year was $18,560.76, and at the end, $35,150.00, operating revenues were $1,434.37, operating expenses $5,196.74, and the net operating deficit $3,716.89.

INCORPORATIONS.

EVERETT, WASH.—Articles have been filed by the Washington Coast Utilities Company for $100,000. The new concern will supply gas, water and electricity to towns about Arlington.

SANTA ANA, CAL.—Articles of incorporation of the Huntington Beach Telephone Company have been filed with a capital stock of $50,000. The sum of $2500 has been subscribed by the five directors who are H. L. Heffner, Huntington Beach; H. Levinson, R. V. Rhodes and C. I. Kline, all of Los Angeles, and James S. Lawshe, of Glendale. The concern is organized for a term of 50 years and plans the erection of a telephone plant with lines which will extend out from Huntington Beach over a radius of 25 miles.

RENO, NEV.—The Honey Lake Valley Mutual Water Users' Association, with D. S. Dickerson, O. Doyle, C. J. Young, W. D. Minckler and Chas. Hollowell as incorporators, has filed articles of incorporation. It is stipulated in the articles that all users of water in the Honey Lake Valley will become owners of the proposed irrigation system after all costs of construction have been paid, and the users of water are given 25 years to pay up their share of the cost of construction. A large acreage of land north of Reno will be furnished with water, and it is expected that a large and rich district will be opened up for cultivation that has been lying idle. Work on the new irrigation will commence at once.

ILLUMINATION.

CHEHALIS, WASH.—The mayor has suggested the advisability of installing standard street lights.

HEMET, CAL.—The city trustees have authorized the installation of a number of additional lights at street intersections.

TWIN FALLS, IDAHO.—The City Council has signed a contract with the Idaho Power Company for installing a street lighting system here.

FRESNO, CAL.—A petition calling upon the board of trustees to sanction the installation of an electrolier system on south J street is being circulated.

EL MONTE, CAL.—The city trustees propose to take up with the electric company the matter of extending its service in the northeastern portion of the city.

PORT TOWNSEND, WASH.—The contract for transformers for the city electric lighting department has been awarded to the Westinghouse Company.

DOUGLAS, ARIZ.—The city council proposes to establish a street lighting district in the downtown section in connection with paving which is now nearing completion.

TACOMA, WASH.—An ordinance has been passed by the council providing for the installation of a street lighting system, consisting of metal standards with single globe lights.

BURBANK, CAL.—The city trustees have passed a resolution, providing for the installation of lights along San Fernando boulevard from Providencia avenue to Cypress avenue.

LOS ANGELES, CAL.—Sealed bids will be received by the board of supervisors up to September 11, for installing a street lighting system in the Bonita Meadows Lighting District.

REDDING, CAL.—The city trustees received no bids for the construction of the second unit of the municipal street lighting system and it was decided to do the work by day labor.

SANTA BARBARA, CAL.—A resolution of intention has been adopted by the city council which provides for concrete light posts for State street. Plans and specifications have also been adopted.

SPOKANE, WASH.—The Spokane, Heat, Light & Power Company has purchased a lot 100x142 adjoining its present property on Railway avenue, and has made provision for future extensions of its plant.

FLORENCE, ARIZ.—Application has been presented to the city council by the Florence Improvement Company, a subsidiary of the Douglas Investment Company, for a franchise for a water and light system in this city.

FULLERTON, CAL.—The installation of a lighting system in the business district will cost about $1 per foot, instead of 60c as estimated. Information to this effect has been sent to the property owners who signed the petition asking for the installation of ornamental lighting posts.

LOS ANGELES, CAL.—A petition has been presented to the board of supervisors asking for the ornamental lighting of Figueroa street, between Innla avenue and Delphi avenue; 121st street between Hoover and the east city limits; 124th street between Hoover and the city limits; Laconia boulevard, between the east city limits and the west city limits.

LOS ANGELES, CAL.—The installation of a lighting system is now being contemplated at Beverly Hills. All the improved part of the town, the Sunset boulevard, from the eastern city limits to Camden Way, will be lighted under the proposed improvement, which provides for 436 single standard lights. Underground conduits will be used and the system will be up-to-date in every respect.

OAKLAND, CAL.—News of importance to Oakland business and financial circles was made recently through the announcement that the Great Western Power & Light Company, one of the largest concerns of its kind in the state, had leased the entire ground floor of the Thompson building, at Seventeenth and Broadway, for a term of ten years. According to Manager F. H. Woodward, the power company intends to be installed in its new downtown offices by October 1. Extensive plans for remodeling are now under way. A $10,000 electric sign will be constructed on the roof of the Thompson building, and from preliminary reports will be the largest of its kind in the West. A striking design is planned in electric light globes. According to Woodward, the company's business in Oakland alone has justified the enlargement of offices. Most of the power being sold is to large corporations and manufactories. The increase in consumers for the past year over 1915 was 24 per cent, while the net earnings increased 21 per cent.

TELEPHONE AND TELEGRAPH.

RENO, NEV.—The telephone company plans to build an additional circuit between Sacramento and Reno at a cost of $21,230.

ST. JOHNS, ARIZ.—Considerable money is being expended by the owners of the Navajo-Apache telephone system in improvements.

ELMA, WASH.—The Elma-Matlock Telephone Company has been incorporated for $5000, and will install a farmer's telephone system about Elma.

COLVILLE, WASH.—The board of county commissioners has set September 11th as the date for hearing the petition of Emil Thoni for a telephone franchise over the county highways.

SAN LEANDRO, CAL.—Telephone wires in the business section of San Leandro along East Fourteenth street from the bridge to Maud avenue are to be placed underground within three years.

HEMET, CAL.—Officials of the Southern Sierras Power Company state that the company is conducting experiments looking to the establishment of wireless stations throughout the territory in which it operates.

ESCONDIDO, CAL.—The city trustees have granted permission to the Schumackal Rural Telephone Company, with H. O. Schumackal as president and H. L. Adrian as secretary, to erect a telephone line along Ash street.

SAN FRANCISCO, CAL.—Thirty thousand seven hundred and twenty dollars covers the Pacific Telephone & Telegraph Company's expenses of the San Francisco-San Mateo portion of the project to provide the necessary traffic facilities over its San Francisco-Paso Robles-Fresno route. It is expected that this work will be finished in about 220 days.

TRANSPORTATION.

SAN FRANCISCO, CAL.—At the request of 1000 residents of the Southern Mission District, the supervisors will consider the possibility of constructing a branch of the Municipal Railway along Army street from Church to Third, thence over a street yet to be laid to Hunter's Point.

MARYSVILLE, CAL.—The officials of the Northern electric Railway have taken under advisement a proposal of the city council that arrangements be made with the Southern Pacific for switching privileges over Ninth street. An effort is being made to secure a route for a new spur track to the shops of the Yuba Construction Company.

TRANSMISSION.

CHLORIDE, ARIZ.—Poles have been ordered by the manager of the Desert Power & Water Company for a power line to be run into Chloride. It is thought that the company will be furnishing light here between October 15th and 30th.

UPLAND, CAL.—Work will begin immediately upon the reconstruction of the interior of the Pacific Electric Company's power house, which was almost completely destroyed by fire. It is said the company will modernize the plant in every particular.

LEHI, UTAH.—A deed has been closed for the building of a power plant at the mouth of deep creek in American Fork canyon to supply power for pumps at the head of the Jordan River which elevate water from Utah Lake for the Associated Canal Company's of Salt Lake county. The plant will cost $175,000. It will have a minimum capacity of 2000 horse power. The plans call for two pipe lines each 1½ miles long.

IRRIGATION.

SALEM, ORE.—Documents authorizing the Morson Land Company to issue bonds in the sum of $30,000 for the completion of the west unit of its irrigation project have been filed with State Engineer Lewis.

MALTA, MONT.—James O'Connor was the only bidder for handling the excavation work on the Milk River project amounting to 615,000 cu. yds. The estimate was $108,352, and the bid was slightly under this.

ST. MARIES, IDAHO.—Property owners in St. Joe, Coeur d'Alene and St. Maries River Valleys held a meeting recently at Harrison and took steps toward creating a drainage district. Dredging of a portion of the Spokane River will be one of the first steps.

WILLOWS, CAL.—Applications have been filed with the state engineer at Sacramento for the formation under the Wright irrigation act of two irrigation districts, the Princeton-Codora-Glenn irrigation district and the Jacinto irrigation district.

ALTURAS, CAL.—Proposed irrigation projects which would water approximately 250,000 acres will be among other important matters taken up at the annual meeting of the Northern California Counties Association, which convenes in Alturas September 28th.

MYRTLE CREEK, ORE.—At a special bond election here last week the taxpayers voted to bond the town for $27,000 for improvement of municipal water and light plant. The project involves the installation of a hydroelectric power dam in the South Umpqua River that will develop at minimum 180 horsepower.

SACRAMENTO, CAL.—Plans are being made for the installation of a pumping plant in the Netherland Reclamation District by P. N. Ashley, reclamation engineer. Two pumps with a capacity of 115,000 gallons will comprise the plant, which will be located on the property of the Holland Land Company. The district comprises 25,000 acres.

SOUTH BEND, WASH.—Eli Rockey of Bay Center and others who have combined with him to form a diking district near the mouth of the Palix River, have in contemplation an engineering project which will reclaim 1750 acres of fertile land. The project contemplates the construction of a dike 1400 ft. long and for a flume dam across the Palix River.

LIVE OAK, CAL.—Residents of the Live Oak section believing that the presence of water within 32 in. of the surface is due to water from the irrigating canal, are contemplating taking over the canal with the idea of drying it up and introducing a pumping system. By this means they can use the water that is in the ground for irrigation without bringing in water from the river.

MODESTO, CAL.—Citizens of the newly organized Waterford irrigation district this week voted bonds to the amount of $465,000 and will at once begin construction of canals that water may be available for the use of the district next spring. The Waterford district will take its water from the Tuolumne River, using the main canal of the Modesto as a right of way from La Grange to the district.

SILVERTON, ORE.—At an election recently to vote on the question of issuing bonds for $21,000 to provide funds for a municipal auxiliary water system, the bonds were authorized by a vote of 141 to 41. This issue automatically cancels a previous issue of $16,000. The change in amount was due to a decision to extend the system farther up the Abiqua. The Silver Falls Timber Company has the contract for the work.

ST. IGNATIUS, MONT.—Bids will be received by the U. S. Reclamation Service at this place until September 20th for the construction of canals and structures on the Flathead project, involving 125,000 cu. yds of excavation, 495 cu. yds. concrete, 1000 yds. paving, 10,000 sq. ft. canal lining, manufacturing and laying 3400 ft. concrete pipe, 210 cu. yds. dry rubble wall, and placing 70,000 lb. of structural and reinforced steel. Work is located from 3 to 10 miles of Ronan, Mont.

ONTARIO, ORE.—For the purpose of putting water on 25,000 acres of rich Malheur county land in the vicinity of Nyssa, the Owyhee Irrigation District was formed. Plans for the project were forwarded to John R. Lewis, state engineer, for his examination. It is proposed to build a big dam 70 ft. high at Duncan Ferry; 15,000 of the 25,000 acres comes under gravity system and the remainder under a pumping plant. It is planned to build a power plant at the diversion dam, and develop enough power to lift water for 10,000 acres of land.

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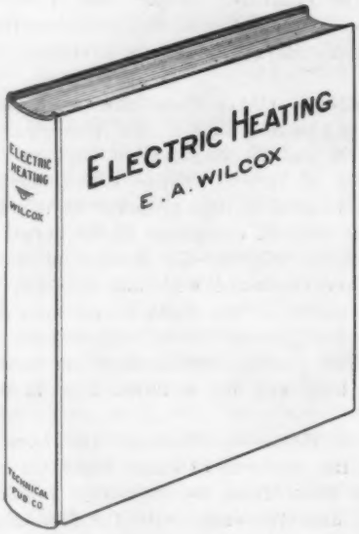

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Number 15

Fuses, Plug. 125 Volts.	List.	Sell.
30 Amp., each	.07	.05
Fuses, Cartridges. 250 Volts.		
0- 30 Amp., each	.25	.20
31- 60 Amp., each	.35	.35
61-100 Amp., each	.90	.80
101-200 Amp., each	2.00	1.80
201-400 Amp., each	3.60	3.20
401-600 Amp., each	5.50	4.90
0- 30 Amp., copper neutral	.20	.20
31- 60 Amp., copper neutral	.35	.35
61-100 Amp., copper neutral	.60	.60
101-200 Amp., copper neutral	.80	.80
201-400 Amp., copper neutral	1.00	1.00
401-600 Amp., copper neutral	1.50	1.50
Fuses Cartridge. 600 Volts.		
0- 30 Amp., each	.40	.40
35- 60 Amp., each	.60	.60
65-100 Amp., each	1.50	1.50
110-200 Amp., each	2.50	2.50
Hack Saw Blades.		
8-inch	.70	.70
10-inch	.85	.85
12-inch	1.00	1.00
Perforated Strap Iron.		
10-foot lengths	.40	.40
Insulators—Each.		
Strain glass or porcelain, ⅜-inch	.0688	.10
Strain glass or porcelain, ½-inch	.1180	.15
Strain glass or porcelain, ⅝-inch	.15	.20
Strain Globe, 2-inch	.05	.10
Strain Globe, 2½-inch	.06	.15
Glass W. U.	.088	.10
Glass No. 9 Pony	.048	.05
Glass, Regular No. 3	.06	.10
Insulating Joints—Each.		
¼x¼ to ⅜x⅜	.40	.40
½x⅛ to ½x½	.60	.60
¾x⅜ to ¾x¾	1.75	1.75
Hickeys to ½-inch	.10	.10
Hickeys to ¾-inch	.17½	.17½
Knobs—Porcelain—Each.		
3½ Knob, each	.05	.05
4½ Knob, each	.02	.02
5½ Knob., solid, each	.01½	.01½
5½ Knob, split, round, each	.02	.02

The correctness of these suggested selling prices is not guaranteed by publisher. Suggestions for corrections are invited.

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Journal of Electricity, Power and Gas
ELECTRICAL PRICE INDEX
Number 16

Lamp Guards.	List.	Sell.
Lamp guard wire	.29	.35
Expanding, Tinned	.28	.25
Cage, Tinned	.25	.25
Lamp Guard Lock	.44	.50
Lamp Guard Bulldog—complete	2.50	2.00
Lamp Guard Half Reflector	.44	.70
Lamp Guard, ordinary portable, with socket	1.30	2.00
Leatherheads—Nails.		
Per lb.	.25	.25
Lugs.		
Amp. Hole. Capacity of Wire Hole.		
30 3/16 2	.04	.04
60 ¼ 4	.08	.10
100 ⅜ 0	.15	.15
200 9/16 0000	.35	.35
400 ⅞ 525,000 C.M.	.80	.80
600 1 3/32 900,000	1.20	1.20
Miscellaneous.		
Asphaltum Paint, gal	1.90	1.90
Beeswax, per pound	.64	.64
Emery Cloth, per ream (400 sheets)	26.50	26.50
Fibre, 1-64, 1-32, per lb	.30	.30
Ins. Staples, per 1000	2.60	3.00
Lacing Twine	3.00	3.00
Lacquer, Black, quart	2.15	2.15
Lacquer, Thinner, quart	1.50	1.50
Milenite Nails, No. 18, per 1000	1.20	2.00
Nails, 6p, 8p, 10p, 20p, per lb	.05	.05
Oil, Lard, per gal	1.20	1.20
Oil, Linseed, pint	.25	.25
Oil, Machine, per gallon	.60	.60
Oil, Motor, gal	.87	.87
Oil, Plumbers Cutting, per gal	1.00	1.00
Oil, Sperm, gal	1.26	1.26
P. & B. Paint, quart	.55	.55
Paraffine, per pound	.30	.30
Pipe caps, ½	.11	.11
Pipe caps, ¾	.18	.18
Pothead Compound, per gal	4.50	4.50
Red Lead, per pound	.25	.25
Sandpaper, per ream (480 sheets)	4.25	4.25
Shellac, per gal	3.20	3.20
Soapstone, per pound	.10	.10
Wood plugs, ½	.01	.01
Wood plugs, ¾	.02	.02
Wood plugs, 1	.03	.03

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ALPHABETICAL INDEX TO ADVERTISERS

The letter and number before each name are used in the classified page following

A-1 American Ever-Ready Works of National Carbon Co..
Los Angeles; 755 Folsom St., San Francisco; Seattle.

B-1 Baker-Joslyn Company..... 2
71 New Montgomery St., San Francisco; 911 Western Ave., Seattle; 353 E. Second St., Los Angeles.

I-1 Benjamin Electric Manufacturing Co.....
590 Howard St., San Francisco.

C-1 Century Electric Co..... 12
906 So. Hope St., Los Angeles; 56 Natoma St., San Francisco; 65 Front St., Portland, Ore.

C-3 Crocker-Wheeler Co.....
87 New Montgomery St., San Francisco; 228 Central Avenue, Los Angeles.

C-4 Cutler-Hammer Manufacturing Co.....
579 Howard St., San Francisco; Morgan Bldg., Portland, Ore.; San Fernando Bldg., Los Angeles.

D-4 Davis Slate & Manufacturing Co..... 3
Chicago, Ill.

D-2 Dearborn Chemical Company..... 11
355 East Second St., Los Angeles; 301 Front St., San Francisco.

E-1 Edison Lamp Works of General Electric Co.....
Rialto Bldg., San Francisco; 724 So. Spring St., Los Angeles.

E-2 Edison Storage Battery Co..... 11
441 Golden Gate Ave., San Francisco.

E-3 Electric Agencies Co.....
247 Minna Street, San Francisco; Central Building, Los Angeles.

E-4 Electric Storage Battery Co.....
743 Rialto Bldg., San Francisco.

E-5 Electric, Railway & Manufacturing Supply Co..... 11
34 Second St., San Francisco.

E-6 Electric Novelty Works.....
533 Mission St., San Francisco.

E-7 Economy Fuse & Mfg. Co.....
Kinzie and Orleans Sts., Chicago.

F-3 Federal Sign System (Electric).....
618 Mission St., San Francisco.

G-1 General Electric Co..... 5-10
724 So. Spring St., Los Angeles; Worcester Bldg., Portland; Rialto Bldg., San Francisco; Colman Bldg., Seattle; Paulsen Bldg., Spokane.

H-1 Habirshaw Electric Cable Co., Inc.....
(See Western Electric Company.)

H-2 Hemingray Glass Co..... 11
236-240 So. Los Angeles St., Los Angeles; 345 Oak St., Portland; 807 Mission St., San Francisco.

H-3 Haller-Cunningham Electric Co..... 11
428 Market St., San Francisco.

H-7 Hurley Machine Co.....
New York and Chicago. (See Pacific States Electric Co.

I-2 Illinois Electric Co.....
261-263 So. Los Angeles St., Los Angeles.

I-3 Interstate Electric Novelty Co..... 3
111 New Montgomery St., San Francisco.

L-1 Leahy Manufacturing Co.....
Eighth and Alameda St., Los Angeles.

L-2 Locke Insulator Manufacturing Co..... 4
(See Pierson, Roeding & Co.)

M-2 McGlauflin Manufacturing Co.....
San Rafael, Cal.

M-3 Moore & Co., Charles C..... 3
Van Nuys Bldg., Los Angeles; Spalding Bldg., Portland; Kearns Bldg., Salt Lake City; Sheldon Bldg., San Francisco; Mutual Life Bldg., Seattle; Santa Rita Hotel Bldg., Tucson.

M-4 Morse Chain Company.....
Monadnock Bldg., San Francisco.

N-1 Nason & Co., R. N.....
151 Potrero Ave., San Francisco.

N-2 National Conduit & Cable Co., The.....
Trust and Savings Bldg., Los Angeles; Rialto Bldg., San Francisco.

N-3 National Lamp Works of G. E. Co.....
(All Jobbers.)

N-4 New York Insulated Wire Co.....
629 Howard St., San Francisco.

N-6 National Carbon Co..... 12
Cleveland, Ohio.

O-1 Okonite Co. (The)..... 12
(All Jobbers.)

P-2 Pacific States Electric Co..... 2
236-240 So. Los Angeles St., Los Angeles; 61-67 Fifth St. No., Portland; 200-210 Twelfth St., Oakland; 575 Mission St., San Francisco; 307 First Ave. So., Seattle.

P-4 Pelton Water Wheel Co..... 11
2219 Harrison St., San Francisco.

P-5 Pierson, Roeding & Co..... 4
Pacific Electric Bldg., Los Angeles; Rialto Bldg., San Francisco; Colman Bldg., Seattle.

P-7 Pittsburgh Piping & Equipment Co..... 12
Monadnock Bldg., San Francisco.

S-1 Schaw-Batcher Company, Pipe Works, The.....
211 J St., Sacramento; 356 Market St., San Francisco.

S-4 Southern Pacific Co..... 2
Flood Bldg., San Francisco.

S-5 Sprague Electric Works..... 3
Rialto Bldg., San Francisco; Colman Bldg., Seattle; Corporation Bldg., Los Angeles; Electric Bldg., Portland; Paulsen Bldg., Spokane.

S-6 Standard Underground Cable Co.....
First National Bank Bldg., San Francisco; Hibernian Bldg., Los Angeles; Central Bldg., Seattle, Wash.; 815 Newhouse Bldg., Salt Lake City, Utah.

T-1 Thomas & Co., R..... 4
Pacific States Electric Co. and Western Electric Co., Pacific Coast Representatives.

T-2 Tubular Woven Fabric Company.....
Pawtucket, R. I.

U-1 United Sheet Metal Works.....
575 Howard St., San Francisco.

W-1 Wagner Electric Manufacturing Company.....
St. Louis, Mo.

W-2 Western Electric Co.....
Eighth and Santee Sts., Los Angeles; 1900 Telegraph Ave., Oakland, Cal.; 680 Folsom St., San Francisco; 907 First Ave., Seattle; 45 North Fifth St., Portland, Ore.

W-3 Ward-Leonard Electric Co..... 12
Mt. Vernon, New York.

W-4 Westinghouse Electric and Manufacturing Co..... 6
50-52 East Broadway, Butte; Van Nuys Bldg., Los Angeles; Couch Bldg., Portland; 212 So. W. Temple, Salt Lake City; 165 Second St., San Francisco; Second and Cherry Sts., Seattle; Paulsen Bldg., Spokane.

W-6 Westinghouse Lamp Co.....
(See Westinghouse Electric & Manufacturing Co.)

W-8 Western Pipe & Steel Co.....
444 Market St., San Francisco; 1758 North Broadway Los Angeles.